

Package ‘IGP’

September 19, 2017

Type Package

Title Interchangeable Gaussian Process Models

Version 0.1.0

Description Creates a Gaussian process model using the specified package.
Makes it easy to try different packages in same code, only the package argument needs to be changed.
It is essentially a wrapper for the other Gaussian process software packages.

License GPL-3

LazyData TRUE

Imports R6, PythonInR

Suggests GPfit, laGP, mlegp, tgp, DiceKriging, GauPro, testthat, lhs, ggplot2, reshape, numDeriv

RoxygenNote 6.0.1

URL <https://github.com/CollinErickson/IGP>

BugReports <https://github.com/CollinErickson/IGP/issues>

NeedsCompilation no

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IGP	<i>IGP general function</i>
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Description

IGP general function

Usage

```
IGP(X = NULL, Z = NULL, package = NULL, ...)
```

Arguments

X	Design matrix
Z	Response matrix or vector
package	Package to use
...	Arguments passed on to IGP_<package>

Value

IGP model

Examples

```
x <- seq(0,1,l=10)
y <- abs(sin(2*pi*x))
IGP(x,y,'DiceKriging')
```

IGP_base

UGP Class providing object with methods for fitting a GP model

Description

UGP Class providing object with methods for fitting a GP model

Usage

```
IGP_base
```

Format

[R6Class](#) object.

Value

Object of [R6Class](#) with methods for fitting GP model.

Fields

X Design matrix
Z Responses
N Number of data points
D Dimension of data

Methods

Documentation For full documentation of each method go to <https://github.com/CollinErickson/UGP/>
`new(X=NULL, Z=NULL, package=NULL, corr="gauss", estimate.nugget=T, nugget0=F, ...)`
This method is used to create object of this class with X and Z as the data. The package tells it which package to fit the GP model.

`Xall=NULL, Zall=NULL, Xnew=NULL, Znew=NULL, ...` This method updates the model, adding new data if given, then running optimization again.

Examples

```
n <- 40
d <- 2
n2 <- 20
f1 <- function(x) {sin(2*pi*x[1]) + sin(2*pi*x[2])}
X1 <- matrix(runif(n*d),n,d)
Z1 <- apply(X1,1,f1) + rnorm(n, 0, 1e-3)
X2 <- matrix(runif(n2*d),n2,d)
Z2 <- apply(X2,1,f1)
XX1 <- matrix(runif(10),5,2)
ZZ1 <- apply(XX1, 1, f1)
```

```
u <- IGP(package='laGP',X=X1,Z=Z1, corr="gauss")
cbind(u$predict(XX1), ZZ1)
u$predict.se(XX1)
u$update(Xnew=X2,Znew=Z2)
u$predict(XX1)
u$delete()
```

IGP_DiceKriging

IGP R6 object for fitting DiceKriging model

Description

Class providing object with methods for fitting a GP model

Usage

```
IGP_DiceKriging
```

Format

[R6Class](#) object.

Value

Object of [R6Class](#) with methods for fitting GP model.

Fields

X Design matrix
Z Responses
N Number of data points
D Dimension of data

Methods

Documentation For full documentation of each method go to <https://github.com/CollinErickson/IGP/>

`new(X=NULL, Z=NULL, package=NULL, estimate.nugget=T, nugget0=F, ...)` This method is used to create object of this class with X and Z as the data. The package tells it which package to fit the GP model.

`update(Xall=NULL, Zall=NULL, Xnew=NULL, Znew=NULL, ...)` This method updates the model, adding new data if given, then running optimization again.

Examples

```
n <- 40
d <- 2
n2 <- 20
f1 <- function(x) {sin(2*pi*x[1]) + sin(2*pi*x[2])}
X1 <- matrix(runif(n*d),n,d)
Z1 <- apply(X1,1,f1) + rnorm(n, 0, 1e-3)
X2 <- matrix(runif(n2*d),n2,d)
Z2 <- apply(X2,1,f1)
XX1 <- matrix(runif(10),5,2)
ZZ1 <- apply(XX1, 1, f1)
u <- IGP_DiceKriging$new(X=X1,Z=Z1)
cbind(u$predict(XX1), ZZ1)
u$predict.se(XX1)
u$update(Xnew=X2,Znew=Z2)
u$predict(XX1)
u$delete()
```

IGP_GauPro

IGP R6 object for fitting GauPro model

Description

Class providing object with methods for fitting a GP model

Usage

```
IGP_GauPro
```

Format

[R6Class](#) object.

Value

Object of [R6Class](#) with methods for fitting GP model.

Fields

X Design matrix
Z Responses
N Number of data points
D Dimension of data

Methods

Documentation For full documentation of each method go to <https://github.com/CollinErickson/IGP/>
`new(X=NULL, Z=NULL, package=NULL, estimate.nugget=T, nugget0=F, ...)` This method is used to create object of this class with X and Z as the data. The package tells it which package to fit the GP model.
`update(Xall=NULL, Zall=NULL, Xnew=NULL, Znew=NULL, ...)` This method updates the model, adding new data if given, then running optimization again.

Examples

```
n <- 40
d <- 2
n2 <- 20
f1 <- function(x) {sin(2*pi*x[1]) + sin(2*pi*x[2])}
X1 <- matrix(runif(n*d),n,d)
Z1 <- apply(X1,1,f1) + rnorm(n, 0, 1e-3)
X2 <- matrix(runif(n2*d),n2,d)
Z2 <- apply(X2,1,f1)
XX1 <- matrix(runif(10),5,2)
ZZ1 <- apply(XX1, 1, f1)
u <- IGP_GauPro$new(X=X1,Z=Z1, parallel=FALSE)
cbind(u$predict(XX1), ZZ1)
u$predict.se(XX1)
u$update(Xnew=X2,Znew=Z2)
u$predict(XX1)
u$delete()
```

IGP_GPfit

IGP R6 object for fitting GPfit model

Description

Class providing object with methods for fitting a GP model

Usage

```
IGP_GPfit
```

Format

[R6Class](#) object.

Value

Object of [R6Class](#) with methods for fitting GP model.

Fields

X Design matrix
 Z Responses
 N Number of data points
 D Dimension of data

Methods

Documentation For full documentation of each method go to <https://github.com/CollinErickson/IGP/>
`new(X=NULL, Z=NULL, package=NULL, estimate.nugget=T, nugget0=F, ...)` This method is used to create object of this class with X and Z as the data. The package tells it which package to fit the GP model.
`update(Xall=NULL, Zall=NULL, Xnew=NULL, Znew=NULL, ...)` This method updates the model, adding new data if given, then running optimization again.

Examples

```
n <- 20
d <- 2
n2 <- 20
f1 <- function(x) {sin(2*pi*x[1]) + sin(2*pi*x[2])}
X1 <- matrix(runif(n*d),n,d)
Z1 <- apply(X1,1,f1) + rnorm(n, 0, 1e-3)
X2 <- matrix(runif(n2*d),n2,d)
Z2 <- apply(X2,1,f1)
XX1 <- matrix(runif(10),5,2)
ZZ1 <- apply(XX1, 1, f1)
u <- IGP_GPfit$new(X=X1,Z=Z1)
cbind(u$predict(XX1), ZZ1)
u$predict.se(XX1)
u$update(Xnew=X2,Znew=Z2)
u$predict(XX1)
u$delete()
```

 IGP_GPy

IGP R6 object for fitting GPy model

Description

Class providing object with methods for fitting a GP model

Usage

IGP_GPy

Format

`R6Class` object.

Value

Object of `R6Class` with methods for fitting GP model.

Fields

X Design matrix
 Z Responses
 N Number of data points
 D Dimension of data

Methods

Documentation For full documentation of each method go to <https://github.com/CollinErickson/IGP/>

`new(X=NULL, Z=NULL, package=NULL, estimate.nugget=T, nugget0=F, ...)` This method is used to create object of this class with X and Z as the data. The package tells it which package to fit the GP model.

`update(Xall=NULL, Zall=NULL, Xnew=NULL, Znew=NULL, ...)` This method updates the model, adding new data if given, then running optimization again.

Examples

```
## Not run:
n <- 40
d <- 2
n2 <- 20
f1 <- function(x) {sin(2*pi*x[1]) + sin(2*pi*x[2])}
X1 <- matrix(runif(n*d),n,d)
Z1 <- apply(X1,1,f1) + rnorm(n, 0, 1e-3)
X2 <- matrix(runif(n2*d),n2,d)
Z2 <- apply(X2,1,f1)
XX1 <- matrix(runif(10),5,2)
ZZ1 <- apply(XX1, 1, f1)
u <- IGP_GPy$new(X=X1,Z=Z1)
cbind(u$predict(XX1), ZZ1)
u$predict.se(XX1)
u$update(Xnew=X2,Znew=Z2)
u$predict(XX1)
u$delete()

## End(Not run)
```

`IGP_laGP`*IGP R6 object for fitting laGP model*

Description

Class providing object with methods for fitting a GP model

Usage

```
IGP_laGP
```

Format

`R6Class` object.

Value

Object of `R6Class` with methods for fitting GP model.

Fields

X Design matrix
Z Responses
N Number of data points
D Dimension of data

Methods

Documentation For full documentation of each method go to <https://github.com/CollinErickson/IGP/>
`new(X=NULL, Z=NULL, package=NULL, estimate.nugget=T, nugget0=F, ...)` This method is used to create object of this class with X and Z as the data. The package tells it which package to fit the GP model.

`update(Xall=NULL, Zall=NULL, Xnew=NULL, Znew=NULL, ...)` This method updates the model, adding new data if given, then running optimization again.

Examples

```
n <- 40
d <- 2
n2 <- 20
f1 <- function(x) {sin(2*pi*x[1]) + sin(2*pi*x[2])}
X1 <- matrix(runif(n*d),n,d)
Z1 <- apply(X1,1,f1) + rnorm(n, 0, 1e-3)
X2 <- matrix(runif(n2*d),n2,d)
Z2 <- apply(X2,1,f1)
XX1 <- matrix(runif(10),5,2)
ZZ1 <- apply(XX1, 1, f1)
```

```
u <- IGP_laGP$new(X=X1,Z=Z1)
cbind(u$predict(XX1), ZZ1)
u$predict.se(XX1)
u$update(Xnew=X2,Znew=Z2)
u$predict(XX1)
u$delete()
```

IGP_laGP_GauPro

IGP R6 object for fitting laGP_GauPro model

Description

Class providing object with methods for fitting a GP model. This mixes laGP and GauPro. It fits the model using laGP, then copies the parameters to a GauPro model for prediction.

Usage

```
IGP_laGP_GauPro
```

Format

[R6Class](#) object.

Value

Object of [R6Class](#) with methods for fitting GP model.

Fields

X Design matrix
Z Responses
N Number of data points
D Dimension of data

Methods

Documentation For full documentation of each method go to <https://github.com/CollinErickson/IGP/>

`new(X=NULL, Z=NULL, package=NULL, estimate.nugget=T, nugget0=F, ...)` This method is used to create object of this class with X and Z as the data. The package tells it which package to fit the GP model.

`update(Xall=NULL, Zall=NULL, Xnew=NULL, Znew=NULL, ...)` This method updates the model, adding new data if given, then running optimization again.

Examples

```
## Not run:
n <- 40
d <- 2
n2 <- 20
f1 <- function(x) {sin(2*pi*x[1]) + sin(2*pi*x[2])}
X1 <- matrix(runif(n*d),n,d)
Z1 <- apply(X1,1,f1) + rnorm(n, 0, 1e-3)
X2 <- matrix(runif(n2*d),n2,d)
Z2 <- apply(X2,1,f1)
XX1 <- matrix(runif(10),5,2)
ZZ1 <- apply(XX1, 1, f1)
u <- IGP_sklearn$new(X=X1,Z=Z1)
cbind(u$predict(XX1), ZZ1)
u$predict.se(XX1)
u$update(Xnew=X2,Znew=Z2)
u$predict(XX1)
u$delete()

## End(Not run)
```

IGP_mlegp

IGP R6 object for fitting mlegp model

Description

Class providing object with methods for fitting a GP model

Usage

```
IGP_mlegp
```

Format

[R6Class](#) object.

Value

Object of [R6Class](#) with methods for fitting GP model.

Fields

X Design matrix
Z Responses
N Number of data points
D Dimension of data

Methods

Documentation For full documentation of each method go to <https://github.com/CollinErickson/IGP/>
`new(X=NULL, Z=NULL, package=NULL, estimate.nugget=T, nugget0=F, ...)` This method is used to create object of this class with X and Z as the data. The package tells it which package to fit the GP model.
`update(Xall=NULL, Zall=NULL, Xnew=NULL, Znew=NULL, ...)` This method updates the model, adding new data if given, then running optimization again.

Examples

```
n <- 40
d <- 2
n2 <- 20
f1 <- function(x) {sin(2*pi*x[1]) + sin(2*pi*x[2])}
X1 <- matrix(runif(n*d),n,d)
Z1 <- apply(X1,1,f1) + rnorm(n, 0, 1e-3)
X2 <- matrix(runif(n2*d),n2,d)
Z2 <- apply(X2,1,f1)
XX1 <- matrix(runif(10),5,2)
ZZ1 <- apply(XX1, 1, f1)
u <- IGP_mlegp$new(X=X1,Z=Z1)
cbind(u$predict(XX1), ZZ1)
u$predict.se(XX1)
u$update(Xnew=X2,Znew=Z2)
u$predict(XX1)
u$delete()
```

 IGP_sklearn

IGP R6 object for fitting sklearn model

Description

Class providing object with methods for fitting a GP model

Usage

```
IGP_sklearn
```

Format

[R6Class](#) object.

Value

Object of [R6Class](#) with methods for fitting GP model.

Fields

X Design matrix
 Z Responses
 N Number of data points
 D Dimension of data

Methods

Documentation For full documentation of each method go to <https://github.com/CollinErickson/IGP/>
 new(X=NULL, Z=NULL, package=NULL, estimate.nugget=T, nugget0=F, ...) This method is used to create object of this class with X and Z as the data. The package tells it which package to fit the GP model.
 update(Xall=NULL, Zall=NULL, Xnew=NULL, Znew=NULL, ...) This method updates the model, adding new data if given, then running optimization again.

Examples

```
## Not run:
n <- 40
d <- 2
n2 <- 20
f1 <- function(x) {sin(2*pi*x[1]) + sin(2*pi*x[2])}
X1 <- matrix(runif(n*d),n,d)
Z1 <- apply(X1,1,f1) + rnorm(n, 0, 1e-3)
X2 <- matrix(runif(n2*d),n2,d)
Z2 <- apply(X2,1,f1)
XX1 <- matrix(runif(10),5,2)
ZZ1 <- apply(XX1, 1, f1)
u <- IGP_sklern$new(X=X1,Z=Z1)
cbind(u$predict(XX1), ZZ1)
u$predict.se(XX1)
u$update(Xnew=X2,Znew=Z2)
u$predict(XX1)
u$delete()

## End(Not run)
```

 IGP_tgp

IGP R6 object for fitting tgp model

Description

Class providing object with methods for fitting a GP model

Usage

```
IGP_tgp
```

Format

`R6Class` object.

Value

Object of `R6Class` with methods for fitting GP model.

Fields

X Design matrix
 Z Responses
 N Number of data points
 D Dimension of data

Methods

Documentation For full documentation of each method go to <https://github.com/CollinErickson/IGP/>
`new(X=NULL, Z=NULL, package=NULL, estimate.nugget=T, nugget0=F, ...)` This method is used to create object of this class with X and Z as the data. The package tells it which package to fit the GP model.

`update(Xall=NULL, Zall=NULL, Xnew=NULL, Znew=NULL, ...)` This method updates the model, adding new data if given, then running optimization again.

Examples

```
## Not run:
n <- 40
d <- 2
n2 <- 20
f1 <- function(x) {sin(2*pi*x[1]) + sin(2*pi*x[2])}
X1 <- matrix(runif(n*d),n,d)
Z1 <- apply(X1,1,f1) + rnorm(n, 0, 1e-3)
X2 <- matrix(runif(n2*d),n2,d)
Z2 <- apply(X2,1,f1)
XX1 <- matrix(runif(10),5,2)
ZZ1 <- apply(XX1, 1, f1)
u <- IGP_tgp$new(X=X1,Z=Z1)
cbind(u$predict(XX1), ZZ1)
u$predict.se(XX1)
u$update(Xnew=X2,Znew=Z2)
u$predict(XX1)
u$delete()

## End(Not run)
```

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